

Appl. No. 10/661,793
Amdt. dated 12/19/2005
Response to Office Action of 09/19/2005

Attorney Docket No.: TS01-1037
N1085-90149

REMARKS/ARGUMENTS

Claims 8-14 were previously pending in this application. Claims 12-14 have been allowed and claims 8-11 rejected. Claim 8 is hereby amended. Applicants respectfully request re-examination, reconsideration and allowance of each of pending 5 claims 8-11 in addition to previously-allowed claims 12-14.

Applicants and their undersigned representative thank the Examiner for the detailed analysis, comments and figures from the referenced documents that were embedded in the Office Action and which proved very helpful.

I. Allowable Subject Matter

10 Applicants thank the Examiner for indicating, on page 8 of the Office Action, that claims 12-14 have been allowed.

II. Rejection of Claims 8-11 Under 35 U.S.C. § 102(e) as being anticipated by Wu

15 On the paragraph numbered "1" on page 2 of the Office Action, claims 8-11 were rejected under 35 U.S.C. § 102(e) as being anticipated by Wu et al. (U.S. Pub. 2005/0042523), hereinafter "Wu". Applicants respectfully submit that these claim rejections are obviated for reasons set forth below.

Amended independent claim 8 recites the features of:

20 means, including a feedback mechanism, for obtaining a critical dimension measurement of said opening created through said layer of etch resist material and assuring that said critical dimension measurement is within design specification.

25 Wu does not teach or suggest the claimed feature of obtaining CD (critical dimension) measurements of the opening created through the layer of etch resist (i.e., photoresist) material, which is commonly known as the ADI (after develop inspect) – CD and which are obtained before the subsequent etching process. Wu, on page 3,

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paragraph 0019 as directed to in the Office Action, is directed to the automatic matching network utilized during the etching procedure used to form the opening of the dielectric, which takes place after the claimed "opening created through said layer of etch resist material" has been formed. Moreover, paragraph 0019 indicates that only system 5 parameters such as the RF plasma bias and ICP (inductively coupled plasma) of the etch process are monitored. Applicants respectfully submit that it is well known in the art that this very etching process alters the CD's of the opening formed in the photoresist. Moreover, Applicants further submit that the etching process during which the system parameters are monitored and which takes place subsequent to the 10 formation of the aforementioned opening, precludes the acquisition of any meaningful data regarding whether the *opening created through the layer of etch resist material - is within design specification*. Paragraph 0019 of Wu is not directed to monitoring any process during the formation of the "opening created through said layer of etch resist material", much less obtaining CD measurements of the opening. Wu therefore does 15 not teach or suggest obtaining CD measurement data of said opening.

Amended independent claim 8 is therefore distinguished from the Wu reference and the rejection of claim 8 under 35 U.S.C. § 102(e) as being anticipated by Wu, should be withdrawn. Claims 9-11 add further features of Applicants' invention and by way of their dependency from claim 8 are also distinguished from Wu. As such, the 20 rejection of claims 9-11 under 35 U.S.C. § 102(e) as being anticipated by Wu, should also be withdrawn.

III. Rejection of Claims 8-11 Under 35 U.S.C. § 102(e) as being anticipated by Lymberopoulos

In the paragraph numbered "2" that appears on page 5 of the subject Office 25 Action, claims 8-11 were rejected under 35 U.S.C. § 102(e) as being anticipated by Lymberopoulos et al. (U.S. Pub. 2004/0092047), hereinafter "Lymberopoulos". Applicants also thank the Examiner for providing commentary, beginning on page 8, with respect to the Applicants' arguments with respect to the Lymberopoulos reference,

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that were filed on July 6, 2005. Applicants respectfully submit that the claim rejections based on the Lymberopoulos reference are overcome for reasons set forth below.

Applicants again point out that, in the paragraphs following the introduction of the Lymberopoulos reference, the subject Office Action again refers to the Wu reference as 5 did the Office Action dated March 8, 2005. Based on the correlation of the pages in paragraphs cited in support of the Examiner's arguments, it is believed that the Lymberopoulos reference was again being discussed.

Lymberopoulos does not disclose

10 "means, including a feedback mechanism, for assuring that the opening created through the layer of etch resist material is within design specification",

much less the feature of

15 "means, including a feedback mechanism for obtaining a critical dimension measurement of said opening created through said layer of etch resist material and assuring that said critical dimension measurement is within design specification",

20 as presently recited in amended independent claim 8. Lymberopoulos approaches the problem of controlling critical dimensions of the etched material, not the opening created through the layer of etch resist (photoresist) material as in the claimed invention. Moreover, Lymberopoulos uses practically an opposite approach as discussed in Applicants' previous response filed July 6, 2005 and as below.

25 On page 5, paragraph 43, Lymberopoulos states "thus, the present invention adjusts the etch recipe based on two factors: (1) photoresist CD . . .". In paragraph 42 of column 5, Lymberopoulos states "The collected CD and depth data is supplied to processor 320; . . . Deviations from target results are used by the algorithm to adjust the etch recipe for the next wafer to be etched". Lymberopoulos therefore accepts the photoresist CD data as an input parameter and does not attempt to control this input

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parameter but rather, uses whatever photoresist CD is provided, to customize the etch recipe based on the photoresist CD and provide an etched CD within the desired specification limit. Lymberopoulos does not attempt to control the photoresist CD. Lymberopoulos thus has no need or motivation to practice the claimed step of assuring
5 that photoresist CD's are within design specification.

Figure 3 of Lymberopoulos shows that the only feedback mechanism (arrow pointing back to step 3200) is from the trench CD map which is monitored after etch and after stripping the photoresist [step 3400] and therefore too late to do anything about the ADI-CD's. The feedback goes back to step 3200 which determines the etch recipe to use. There is no feedback mechanism that influences the ADI-CD's produced as a
10 result of steps 350, 3000 and 3100.

In sharp contrast, the present invention provides the advantage and is distinguished from Lymberopoulos because the claimed invention provides means, including a feedback mechanism, for assuring that the Critical Dimension
15 Measurements of the opening in the photoresist, i.e., the ADI-CD, is within design specification. The present invention *actively controls* the ADI-CD with a feedback mechanism. Lymberopoulos does not even address this issue.

Moreover, the Examiner, in the paragraph bridging pages 8-9, states "Applicants are directed to FIG. 3, where Lymberopoulos discloses the step of inspect the trench
20 depth and critical dimension CD 3500 using the measuring tool 310 as disclosed in FIG. 1. This process is as disclosed by Lymberopoulos inherently assuring that the opening created through the layer of etch resist material 250 and the insulation material 240 is within design specification (page 4, paragraphs [0035] – [0036])."

Applicants respectfully submit that this is not the case in semiconductor
25 processing. The fact that the after-etch CD, the CD measured at step 3500 of Lymberopoulos, is within design specification, certainly does not inherently assure that the opening which had existed in the photoresist layer, i.e., the ADI-CD, was within a

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design specification. Rather, Lymberopoulos stands for the proposition that this assumption is absolutely not true. Lymberopoulos provides that even when the critical dimensions of the opening in the photoresist material is not within design specification, the etch recipe can be tailored to produce an after etch CD measurement, that is within
5 specification.

Amended independent claim 8 is therefore distinguished from Lymberopoulos. Dependent claims 9-11 are therefore also distinguished from Lymberopoulos and the rejection of claims 8-11 under 35 U.S.C. § 102(e) as being anticipated by Lymberopoulos should be withdrawn.

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CONCLUSION

Based on the foregoing, each of claims 8-14 is in allowable form and the application is therefore in condition for allowance, which action is respectfully and expeditiously requested.

5 The Assistant Commissioner for Patents is hereby authorized to charge any additional fees or credit any excess payment that may be associated with this communication to Deposit Account 04-1679.

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Respectfully submitted,



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